Statistical Analysis of Tropical Cyclones in the Solomon Islands

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This work examines the tropical cyclone (TC) activity in Solomon Islands (SI) using the best track data from Tropical Cyclone Warning Centre (TCWC) Brisbane and Regional Specialised Meteorological Centre (RSMC) Nadi. Firstly, the long-term trend was investigated. The long-term trend analysis showed that the frequency of TCs has been decreasing in this region while average TC intensity becomes strong. Then the datasets were classified according to Madden-Julian Oscillation (MJO) and El Nino Southern Oscillation (ENSO) indexes provided by Bureau of Meteorology (BoM). TC genesis patterns significantly depend on the MJO-TC relationship over the SI region. The MJO has sufficiently influenced TC activity in the SI region with more genesis in phases 6-8. Among them, the most frequent genesis was observed in phase 6, in which lowest outgoing longwave radiation (OLR) is seen around SI region with enhanced convective activity favorable for TC genesis. In contrast, TC genesis occurs less frequently in phases 1, 2, and 5. The amplitude of MJO has notable effect on TC intensities. For example, relatively weak TCs in the gale category was associated with the inactive phases. It is also found that more TCs are generated in El Nino years compared to La Nina and neutral years. The TC genesis locations during El Nino (La Nina) period were significantly displaced to the north (south) over SI region. TCs during El Nino condition tended to be strong. This work also argues that the modulation and enhancements for TCs in the SI region may also be influenced by other seasonal climatic variability backgrounds like South Pacific Convergence Zone (SPCZ) and large-scale environmental conditions (e.g. sea surface temperature, low level relative vorticity, vertical wind shear, and upper level divergence). Finally, TC tracks in different motions were also checked using composites of wind fields between 1000–200 hPa. The flow patterns showed strong relationship to mid tropospheric 700-400 hPa mean steering flow.

